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The difference in alcohol consumption of high- and low-dependent drinkers with subjective craving differing in affect

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Abstract

Craving plays an essential role in alcohol dependence and represents a great risk for alcoholics to engage in alcohol consumption and therefore increasing the risk for relapse. For the sake of reducing craving thoughts, the reactivity on specific craving thoughts and diminishing the consequences referring to mortality and morbidity, it is important to gain a deeper insight in the construct of craving thoughts and the factors that are related to those. Previous research on craving indicated that craving would underlie the affected mood, as one would drink to enhance a positive affected mood and to cope with a negative affected mood. Hence, this study focuses on the effect of dependency on the relation between negatively/positively affect craving thoughts and the consumption of alcohol. The analyses are based on a self-selected sample of 108 alcoholics, aged 12 to 75 with different dependence levels as defined by the DSM-V, who partook in the online treatment *Alcohol De Baas*, of which data was used from the intake questionnaire, the *Drinkwijzer* craving scale and the closing questionnaire after completing the treatment. Hereby, the items of the *Drinkwijzer* scale were categorized in terms of positive and negative affect. The findings of the current study indicated a moderator effect of dependency on the relation between craving thoughts with a positive affect and alcohol consumption. Thus, low-dependent drinkers would be more reactive on situations, thoughts and emotions with a positive affect than high-dependent drinkers. Also, it was found that dependency would predict both subjective craving thoughts and craving thoughts with a negative affect. The remaining results were partly confirmatory with previous research, which could mostly be explained by the uniqueness of the current sample, which is seen in the difference of the findings compared to other studies. Still, the results indicate the importance of distinguishing between levels of dependency and also on the affect of craving thoughts for future research and treatment.

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Introduction

The general consumption of alcohol can embody serious problems like for example drunk driving or intoxication. More severe would be alcohol abuse, which occurs with heavy drinkers and could lead to serious consequences regarding economic costs, social problems and particularly problems in terms of mortality and morbidity (Postel, de Haan, ter Huurne, Becker, & Jong, 2010). Thus, it is essential to treat alcoholism in order to reduce the consequences that follow problem drinking. Nowadays, online therapies are made available for dependent drinkers to widen the accessibility of alcohol-treatments. Compared to face-to-face interventions, online-interventions face lower levels of participation barriers, while at the same time being able to reach larger and more diverse groups of alcoholics (Postel, et al., 2010). Also, Postel (2010) stated that online-treatments would be effective, especially those in which therapists were involved. Despite the effectiveness and range of treatment approaches, research revealed that two of three alcoholics would relapse and resume drinking after engaging in alcohol treatment, which would make it a serious problem to counteract the effectiveness of such treatments (Mathes, Claghorn, & Largen, 1979). Also, Mathes et al. (1979) stated that even after years or months of cessation of drinking, relapse can occur which would make the problem of alcohol dependence persistent over longer periods of time. Thus, even with alcohol abstinence, alcohol dependence severity, drinking obsessions and drinking compulsions still continue of which craving is mostly an essential component. (Bohn, Krahn, & Stealer, 1995). Therefore, the present study aims to examine the role of alcohol dependency in the maintenance of alcohol consumption through subjective craving.

Regarding the concepts of obsessions and compulsions related to alcohol, craving is an important and powerful concept. On the one hand it could provide essential information on prevention, treatment, relapse and preventing relapse, especially in relation to alcohol and drugs. On the other hand, craving represents a significant hardship to a successful recovery, playing a motivating role in the acquisition and maintenance of dependence (Monti, et al., 2004). As Tiffany and Conklin (2000) stated, craving would provide the essential cause for relapse after attempts of cessation. This can be supported by Anton, Moak and Lathamp (1995) who measured alcohol dependence and craving thoughts with the *Obsessive Compulsive Disorder Scale* (OCDS) and found a significant relationship between craving and dependence based on the OCDS score of the patients and the alcohol consumption after the therapy, thus the risk for relapse. In general, craving can be described as ‘a subjective experience, a state of desire or wanting’, which on the one side can be pleasurable and energetic but on the other side also aversive, confusing and frustrating for the individual (Monti, et al., 2004, p. 284). This is

only one description of craving as the concept of craving is highly debated with many different models and findings (Lowman, Hunt, Litten, & Drummond, 2000; Kozlowski, & Wilkinson, 1987). Also, Monti et al. (2004) as well as Tiffany (1999) proposed that the detection and acquisition of the construct of craving would be highly difficult due to its multidimensionality and complexity, which could partly explain the unavailability of a valid definition. Therefore it should be in the interest of improving treatment and gaining a deeper understanding of relapse to examine craving as a concept.

There are several models to explain the development of craving, which can be categorized as cognitive-behavioral, psychobiological, motivational or conditional. The focus of the current study, however, lies mainly on the model of classical conditioning as it is likely to be the cause for the maintenance of alcohol dependence (Cooney, et al., 1997). In the classical conditioning model for craving, subjective craving is seen as a response on a conditioned stimulus that is related to alcohol (Poulos, & Hinson, 1981). For example, Poulos et al. (1981) suggested that regularly drinking in a negative mood in response to subjective craving thoughts would lead to the affected mood becoming part of the conditioned stimulus. This is supported by Cooney et al., (1997) who stated that, becoming part of the conditioned stimulus, craving thoughts would increase, when experiencing negative mood. An example of negative mood becoming part of the conditioned stimulus could be drinking, after having a stressful day at work in order to numb the thoughts about if taking the job was the right choice. Experiencing such a situation often goes paired with negative affected mood as frustration or future fears. For instance, frustration in general could become part of the conditioned stimulus, which would possibly result in experiencing craving when being frustrated, even after cessation (Poulos, et al., 1981) which would then result in relapse.

The earlier example of the frustrated worker serves as an introduction to the affect as component of the conditioned stimulus. The mood or affect of craving stimuli or so called cues plays an important role in influencing the threat of craving thoughts and relapse (Cooney, et al., 1997). In the present study, a difference is made between positive and negative affect. A Positive affected mood, for instance, could be associated with situations, thoughts or emotions that occur when feeling confident, content or being in a good mood. Hence, a negative affected mood could be related to situations, thoughts and emotions like trembling because of alcohol deprivation, being in a depressed mood or, like in the example, having a stressful day at work (Johnson, & Gurin, 1994). The reason for distinguishing between positive and negative affect is that although a majority of research accentuates the relationship between negative affect and subjective craving as well as relapse, there could be an existing relationship between relapse,

subjective craving and positive affect. (Cooper, Frone, Russell, & Mudar, 1995). Cooper et al. (1995) suggested that regulating one's affective experience is an important motivation forming the basis for subjective craving and relapse. This also includes that people would not only crave to drink to reduce the negative affect when they are for example anxious or over aroused but as well as to enhance the positive affect.

Nonetheless, although studies have found a significant influence of subjective craving on the risk of relapse (Monty, et al., 2004; Tiffany, et al., 1999; Anton, et al., 1995), it is important to acknowledge that the level of dependence has to be taken in account as a moderating factor. Thus, Flannery et al. (2001) suggested that the severity of alcohol dependence assessed by using the OCDS, which was validated earlier by Anton et al. (1995), would have a significant influence on craving and alcohol use. Also, Skinner and Allen (1982) found that the level of alcohol dependence would positively correlate with lack of success to accomplish controlled drinking goals, which would possibly end up in relapse, whereas the specific role of dependence is still unclear. In the present study, alcohol dependence will be categorized as the DSM-V classification *Alcohol Use Disorder* (AUD) of which the severity is defined as mild/moderate (the presence of 1 to 5 symptoms) and severe (the presence of 6 or more symptoms) (American Psychiatric Association, 2013). This relies on suggestions of earlier studies which evaluated the DSM-V categorization of alcohol dependence as AUD as valid predictor (Hasin, Schuckit, Martin, Grant, Bucholt, & Helzer, 2003; Hagman, & Cohn, 2011). As the World Health Organization (WHO) states, alcohol dependence has several features, which include the severity of limited control, salience of drink-seeking behavior, increased tolerance to alcohol, intense and regular alcohol withdrawal symptoms and reestablishment of the behavior after abstinence (Skinner, & Allen, 1982; Edwards, & Gross, 1976). Those factors would lead to a greater risk of relapse and subjective craving would have a greater influence on the consumption of alcohol with high-dependent drinkers (Edwards, & Gross, 1976). As Skinner et al. (1982) stated, the level of dependence would influence the tendency to react on subjective craving.

Thus, seeing craving as a complex construct as it is and assumedly having an influence on relapse, it is the goal of this study to examine the role of dependency on the effect of positive and negative craving situations on the alcohol consumption and if situations with a specific affect cause more or less alcohol consumption for high- or low-dependent drinkers. As Cooper et al., (1995) stated that craving thoughts and relapse would be higher with a negative affected mood, than with a positive affected mood, it would be also important to examine, if affect is a factor that has to be taken into consideration, when assessing the influence of craving thoughts

on relapse. Therefore, it is also important to assess if the affect of different situations, thoughts and emotions influences the intensity of experienced subjective craving as well as the alcohol consumption. Also, it will be examined, if dependency has any other effect on craving thoughts and/or relapse. It is thus hypothesized that *subjective craving (H1) would predict the alcohol consumption in 30 days after treatment*. Regarding the influence of dependence, it will be hypothesized, that *high-dependent drinkers report significantly more subjective craving in general than low-dependent drinkers (H2)* which also applies for *positive affect (H3) and negative affect (H4)*. In the same case, it will be hypothesized that *the level of alcohol dependence has a significant effect on the alcohol consumption (H5)*. Thirdly, it is hypothesized that *the intensity of subjective craving would be higher in situations, thoughts and emotions associated with a negative affect compared to those associated with a positive affect (H6)*. Last, it will be hypothesized that *high-dependent drinkers would be significantly more reactive to subjective craving than low-dependent drinkers, which includes total affect craving (H7), negative affect craving (H8) and positive affect craving (H9)*.

Accordingly, the data will be retrieved from the intake questionnaire, the *Drinkwijzer* questionnaire and the closing questionnaire of the Dutch online alcohol dependence treatment *Alcohol De Baas*.

With information retrieved from this study, and in the case of craving situations, thoughts or emotions with a specific affect which would low- and high-dependent drinkers make drink more or less than each other it could be possible to develop and improve the online treatment per level of dependence.

Methods

Participants

The research is based on a self-selected sample of 108 respondents that partook in the *Alcohol De Baas* online treatment, of which the applicants were acquired via different channels such as advertisements in the press and knew about the online-therapy through online research or general practitioners that were recommending the treatment. In general, the sample consisted of 51 male (47.2%) and 57 female (52.8%) alcoholics of which the average age was 47.82 (range=21-75; SD=10.46). As mentioned before in the *design* section, the participants were divided into two subgroups by making use of a cut-off score conform to the DSM-V (American Psychiatric Association, 2013), relying on ‘alcohol dependency’. Hence, 44 participants were

in the ‘low-dependency’-group (40.7%) as 64 participants were in the ‘high-dependent’-group (59.3%).

Materials

In total, 3 different questionnaires were used for this study. At first, an intake questionnaire, which contains 24 items that consist of questions about age, sex, and other important demographic factors such as nationality or cultural heritage, and, the subject of interest for this study, alcohol dependency. In the intake questionnaire, dependency based on the DSM-V is measured with different items that are asking dichotomous (yes vs. no) and retrospective questions about the alcohol use in the last 12 months of the respondent’s life (e.g. ‘Did you notice that in the last 12 months you needed to consume more alcohol than usual to gain the same effect or that the usual amount of alcohol had a lower effect on you?’).

The second questionnaire was the *Drinkwijzer*, which is a questionnaire containing 50 items referring to different situations, thoughts and emotions. In this particular study, the items were classified according to the affect of the situation, thought or emotion (positive affect vs. negative affect), which resulted in a total of 19 items in the group ‘positive affect’ and 31 items in the group ‘negative affect’. The items consist of subjective experienced ‘craving thoughts’ (none/few vs. quite much vs. very much).

The third questionnaire was given after the end of the online treatment to measure count of total consumed standard glasses of alcohol in a period of 30 days.

Generally, a functioning computer with internet access was necessary to participate in the online treatment and to respond to the questionnaire survey as it was also offered online.

Design

In the current research, a questionnaire survey design was applied. By dividing the participants into subgroups of the independent variable (IV) *dependency* (low-dependency vs. high-dependency) a within groups design was employed additionally. The secondary IV’s were the items presented in the *Drinkwijzer*. Those were consisting of situations, emotions and thoughts but were for the purpose of the research divided into *positive affect* and *negative affect*. On those, the participants were asked to report several dependent variables (DV’s) which were *craving thoughts* (none/few vs. quite much vs. very much) and *alcohol use* ((almost) never vs. regularly vs. (almost) every time).

Procedure

In the beginning of the online treatment program *Alcohol De Baas*, the applicants were asked to participate in an intake questionnaire in order to determine the conditions under which they were about to start the treatment. This includes demographic information as well as more detailed information about their alcohol dependence. The *Drinkwijzer* questionnaire was accessible 3 years from 2012 to 2015. As seen as in Appendix 12, the phase, in which the participants were asked to fill out the questionnaire was the 5th phase called *Drinkwijzer* and thus during the treatment. Appendix 13 shows the information, the participants were given before completing the survey, which includes the purpose of the survey. After completing the treatment, a follow up questionnaire was presented to the participants. This had the purpose to measure the effect of the treatment for example by determining the count of standard glasses 30 days after the therapy.

Analysis

The data, which has been used for the sake of the recent study has been analyzed with the *Statistical Package for the Social Sciences*. As for the *Drinkwijzer*, the 50 items were categorized into items relating to *positive affect* and *negative affect* based on face validity. A test of inter rater reliability was used to examine if the categorization of the items based on their content was reliable with a 2nd rater and also to avoid subjectivity. Additionally, exploratory factor analyses were conducted to investigate the eigenvalue of the individual items in order to examine underlying factors. Based on the exploratory factor analysis, the scale of previously 50 items was reduced to 25 items, on which an additional exploratory factor analysis was conducted to examine if it then would contain 2 factors applicable to negative and positive affect. Also, a scale reliability analysis with the new 25 items scale was conducted to be able to evaluate the internal consistency. Furthermore, several analyses were performed to give answers to the research questions. At first, a regression analysis was conducted to explore, if there *subjective craving* predicts the *consumption of alcohol* (see Figure 1).

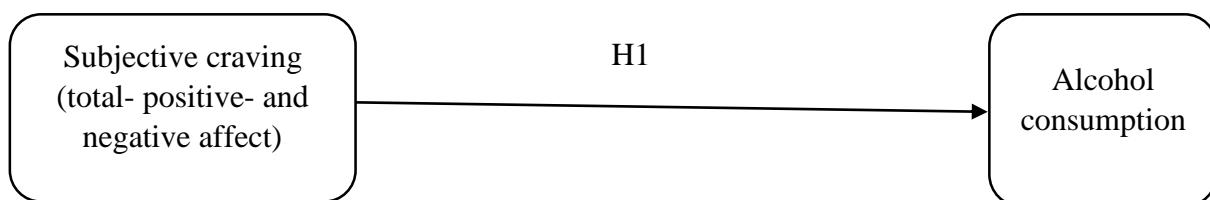


Figure 1: Subjective craving as predictor of alcohol consumption (H1)

To examine the influence of *dependency* on *subjective craving (total-, positive- and negative affect)* and *alcohol consumption*, a test of between subjects effect was conducted. Hereby, *dependency* was used as the fixed factor variable, whereas *subjective craving* and *alcohol consumption* were DV.

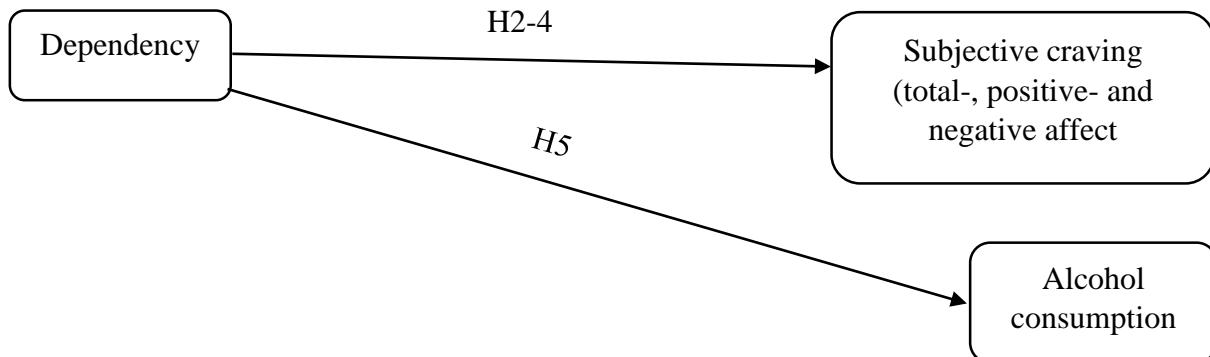


Figure 2: Dependency as predictor of subjective craving (total- (H2), positive- (H3) and negative (H4) affect) and alcohol consumption (H5)

Also, a paired samples t-test was run in order to compare the mean scores of *craving with negative affect* and *positive affect* (see Figure 3).

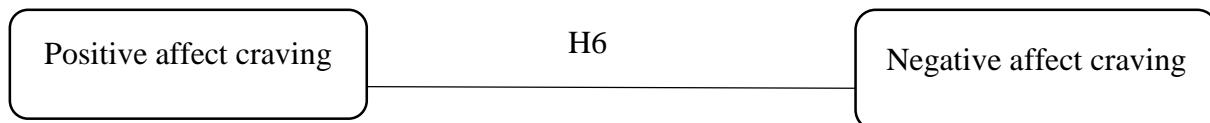


Figure 3: Comparison of positive- and negative affect craving (H6)

To conclude the analysis, 3 moderator analyses were performed with *dependency* as the moderator variable, *alcohol consumption* as DV and *craving*, *craving with positive affect* and *craving with negative affect* each as IV (see Figure 4).

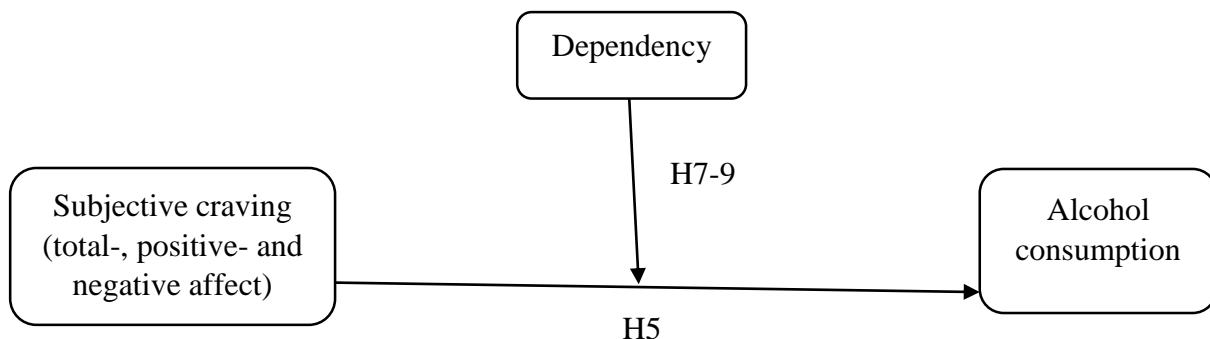


Figure 4: Moderation analysis with dependency as potential moderator for the effect of subjective craving (total- (H7), negative- (H8) and positive affect (H9)) on alcohol consumption

Results

Scale construction

Firstly, an exploratory factor analysis with the 50 items of the *Drinkwijzer* to examine the underlying factors of the scale was conducted. The results showed that the original scale of 50 items contained a total of 10 factors with items having an absolute value of at least .4. The labelling of the factors were as followed. Factor 1 was labelled *negative affect*, factor 2 *social drinking*, factor 3 *positive affect*, factor 4 *being alone* and factor 5 *food*. The rest of the factors could not be labelled as the content of the items did not match on any label. This states that the 50 items scale would contain more dimensions than *positive affect* and *negative affect*. Thus, based on the factor analyses 21 items containing factor 1 were used for the *negative affect* scale. 5 items of the factor 3 were used for the *positive affect* scale. 2 items that were containing factor 1 and 3 (t36 ‘When I feel lonely’; t5 ‘When I am in a haste’) were as well as the remaining 32 items excluded from further analysis as their content would additionally to the results of the factor analysis not fit the scales of *positive affect* and *negative affect* (see Appendix 3a and Appendix 3b).

The remaining 26 items were then, categorized into *positive affect* and *negative affect* by two independent raters. The 1st rater assigned all items according to the results of the factor analysis, whereas the 2nd rater was assigning the items based on the content, thus face validity. The inter-rater reliability analysis resulted in a Cohen’s Kappa of .766, which is sufficient.

Furthermore, a scale reliability analysis was conducted with the 26 items of the *Drinkwijzer* scale. The result of a Cronbachs’s Alpha of .944 indicates a high scale reliability. The Cronbach’s Alpha would not be heightened significantly if any item was deleted, which is why it was refrained from doing so.

Descriptive statistics

Regarding the descriptive statistics of the used variables, as seen in table 1, the participants had a mean score of 1.76 (SD=.46) on general *craving* without dividing between *positive* or *negative affect*. The mean score on *craving with negative affect* was 1.77 (SD=.52), which is quite similar to the mean score of *craving* without regards to the affect. Looking at the mean score of *craving with positive affect* ($M=1.68$; $SD=.48$), one can see that it is lower than both mean scores on *craving* and *craving with negative affect*. Those score state that the average participants would experience *none/few* to *quite much* craving thoughts. Also, the *alcohol consumption* in a period of 30 days was measured of which the mean score is 52.21 (SD=86.731; Min=0; Max=688). Thus, the descriptive statistics of *alcohol consumption* state that the average participants

consumed 52.21 standard glasses of alcohol in a period of 30 days after the treatment with a maximum up to 688 standard glasses, which is surprisingly high.

Table 1: Descriptive statistics for age, craving score, craving score with negative, craving score with positive affect and alcohol consumption in 30 days.

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Valid N (listwise)	108				
Age	108	21	75	47,82	10,458
Total affect craving	108	1	3	1,75	,462
Negative affect craving	108	1	3	1,77	,524
Positive affect craving	108	1	3	1,68	,480
Alcohol consumption in 30 days	150	0	688	52,21	86,731

Inferential statistics

H1: Subjective craving would predict the alcohol consumption in 30 days after treatment.

As to the first regression analysis, the results show that there is no significant influence of *subjective craving* on the *alcohol consumption* at all (see Appendix 4-6).

H2-5: High-dependent drinkers report significantly more craving thoughts in general than low-dependent drinkers which also applies for positive affect and negative affect and alcohol consumption.

The results of the test of between subjects effects, as shown in table 3, indicate that there is a significant difference between *low-dependent* and *high-dependent* drinkers on *total affect craving* ($F(1, 106)=9.22$; $p<0.05$) as well as on *negative affect craving* ($F(1, 106)=9.611$; $p<0.05$). Furthermore, the regression analysis shows that *dependency* is no predictor of *positive affect craving* ($F(1, 106)=.91$; $p=.342$), which states that *high-* and *low-dependent* drinkers would not differ in their *positive affect craving*. This is the same case with *alcohol consumption* as the regression analysis shows that *dependency* does not predict the *alcohol consumption in 30 days* after the online treatment ($F(1, 106)=1.970$; $p=.163$).

Table 3: Test of between subjects effect with dependency as DV, alcohol consumption in 30 days and craving scores as IV

		Sum of Squares	df	Mean Square	F	Sig.
Dependency	Total affect craving	1,824	1	1,824	9,220	,003
	Positive affect craving	,210	1	,210	,910	,342
	Negative affect craving	2,443	1	2,443	9,611	,002
	Alcohol consumption in 30 days	15433,943	1	15433,943	1,970	,163

H6: The intensity of subjective craving would be higher in situations, thoughts and emotions associated with a negative affect compared to those associated with a positive affect.

The results of the paired-samples t-test show that no significant difference can be found between the *negative affect craving* and *positive affect craving* ($t=-1.731$; $df=107$; $p=.086$) as it can be seen in table 4. This indicates that the *affect* of the situations, thoughts and emotions would not predict *subjective craving*.

Paired Samples Test

	Paired Differences							Sig. (2-tailed)	
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference					
				Lower	Upper	t	df		
Pair 1 Craving scores with positive affect - Craving scores with negative affect	-,09744	,58509	,05630	-,20905	,01417	-1,731	107	,086	

H7-9: High-dependent drinkers would be significantly more reactive to subjective craving than low-dependent drinkers, which includes total affect craving, negative affect craving and positive affect craving.

In reference to the moderator analyses, a significant negative moderator effect of *dependency* on the relation between *positive affect craving* and the *alcohol consumption* could be found ($t=-2.013$; $p<.05$), which indicates that *positive affect craving* would predict relapse in *low-dependent* drinkers only. The R^2 value of .064 on the other hand shows that the data represents relatively little of the variability of the response data around the fitted regression line.

Table 2: Moderator analysis with dependency as potential moderator, positive affect craving as IV and alcohol consumption in 30 days as DV

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	54,178	8,434		6,424	,000
Positive affect craving	18,400	17,639	,099	1,043	,299
Dependency	94,311	62,139	,524	1,518	,132
Dependency*p ositive affect craving	-72,486	36,008	-,695	-2,013	,047

a. Dependent Variable: Alcohol consumption in 30 days

Furthermore, no other significant moderator effects could be found in the other models (see Appendix 15-16).

Discussion

The current study

The present study aimed to examine if *subjective craving* would predict the alcohol use after the treatment, as well as to investigate if *dependency* represents the predictor of *subjective craving* and the *alcohol consumption*. Also, the focus was to inspect the difference between *positive affect craving* and *negative affect craving*. Most importantly, the current study focused on the exploration of the role of baseline dependency of alcoholics during treatment as a moderator in the relation between retrospective *subjective craving* and *alcohol consumption* in 30 days after the online-treatment *Alcohol De Baas*.

Principally, it was found that *subjective craving* would not serve as predictor of *alcohol consumption*. In general, the results show that *dependency* predicts *total affect craving* without differing between affect and *negative affect craving*. In contrast, the predictive value of *dependency* the *alcohol consumption* as well as on *positive affect craving* were found to be non-significant. Also, retrospective reported *negative affect craving* did not differ significantly from *positive affect craving*. Regarding the moderator analyses that were conducted, only the model containing *positive affect craving* showed a significant moderation effect of *dependency*. Compared to that result, the other models with *total affect craving* and *positive affect craving* did not show any significant moderation effect of *dependency* at all.

Interpretation of the results

The results state that high-dependent drinkers would experience significantly more *total affect craving* as well as *negative affect craving* than low-dependent drinkers, which was expected. This would confirm H1 and H3 and accords with the research of Anton et al. (1995), who measured alcohol dependence with the OCDS and found that *dependence* would predict *subjective craving*. In contrast, the results also state that high- and low-dependent drinkers would not differ significantly in their *alcohol consumption in 30 days* after treatment and their experienced *positive affect craving*, which is why H3 and H5 will be rejected. Compared to the significant results, these contradict the findings of Anton et al. (1995), whereas the non-significant effect of *dependency* on *positive affect craving* is especially interesting in contrast to the significant effect on *negative affect craving*. This would mean that high- and low-dependent drinkers would only differ in their *negative affect craving* but not with a *positive affect*. It would merely be possible to explain this result by stating that a confounding variable exists that makes high-dependent drinkers being more prone to experience *negative affect craving* for alcohol than low-dependent drinkers. For instance, the confounding variable could be the severity of depressive symptoms. The non-significant influence on the *alcohol consumption* could be partly explained by seeing the progress in therapy as an artifact, whereas participants would regulate their alcohol consumption until after the treatment independent of their dependence level.

Comparing the means of *negative affect craving* with *positive affect craving* showed that the *affect* of the situations, thoughts and emotions would not predict *subjective craving* at all. This leads to rejecting H6, whereas the result agrees with Cooper et al. (1995). He states that the intensity of *subjective craving* would not differ when being triggered by the motivation to enhance a positive affected mood or to cope with a negative affected mood.

Unexpectedly, the reported *craving* would have no significant effect on *the alcohol consumption in 30 days* after the treatment. Therefore, H1 will be rejected, which does not conform with Potgieter, Deckers and Geerlings (1999), who supposed that craving thoughts and relapse would at least positively correlate. In contrast, this finding is supported by Sass, Soyka, Mann and Zieglgänsberger (1996), who researched if relapse could be prevented with the medicament Acamprosate, which suppresses the possible effects of alcohol withdrawal as for example a heightened consumption. They could not confirm a significant reduction in *subjective craving* even though they found an efficient way to reduce the consumption of alcohol. Additionally, the result can be explained if the progress in therapy is described as

artifact, which was having an effect on the general alcohol consumption or other factors influencing the alcohol consumption. Those could have regulated the alcohol consumption after the treatment.

The moderator analyses revealed a significant moderator effect of *dependency* on the effect of *positive affect craving* on the *alcohol consumption in 30 days*. Although the data of the model does predict relatively little of the variance, as indicated by the R^2 value, the result shows that *subjective craving* with situations, thoughts or emotions with a *positive affect* would make low-dependent drinkers drink significantly more than high-dependent drinkers. This finding is partly contradicted by Cyders et al. (2007), who did research on so called *positive urgency*, the tendency to act risky and impulsively in response to a positive affected mood. Hereby, they stated that impulsivity would have a significant role in a risk model including alcohol consumption as risky behavior being triggered by a positive affected mood. It is thus unsure, if it would be too far-fetched if one were to say that Rubio et al. (2008) found in their 4-year follow up study that behavioral impulsivity would be a predictor for alcohol dependence severity. In other words, one could rather assume high-dependent drinkers to act risky and impulsively and drink significantly more in response to a positive affect. This leads to a possible explanation of this result, which could be that the impulsivity could be predicted by the age of the participants (Steinberg, Albert, Cauffman, Banich, Graham, & Woolard, 2008). Hence, further research would be needed to examine the age distribution in the high- and low-dependent groups. An additional explanation could be that low-dependent drinkers would be in an early stage of dependence during which they would be more responsive to a positive affected mood. The results of the moderator analyses with *total affect craving* and *negative affect craving* were non-significant, whereas especially the non-significant moderator effect of *dependency* with the *negative affect* model is contradicted by Cooney et al. (1995). In their research, alcohol dependence was predictive of especially negative mood reactivity, which is why it would be expected to find a moderating effect of dependency. This results in rejecting H7, H8 and H9. Concluding, it can possibly be supposed that, positive mood reactivity could be common in the onset of dependency as could negative mood reactivity be present with the maintenance or perseverance of alcohol dependence.

Recommendations and limitations

Concerning the strengths of this study, the ecological validity was sufficient due to the in particular valid study sample. The self-selected sample contained alcohol dependent subjects that were willing to participate in the online-treatment based on their intrinsic motivation.

Hence, it would be more probable to show a higher engagement to successfully complete the program by also taking the questionnaires seriously. This also includes that all questionnaires used in the research were self-administered. This resulted in personalized treatments and with the anonymity of the online-therapy the probability to be biased in terms of socially desirable answers or reactivity to any kind of factors that come with not being anonymous was lowered. Therefore, it is essential to acknowledge that this study differs significantly from the approach of other alcohol- or craving-related studies, which were approaching participants in a more aggressive, e.g. via advertisements (Cooper, et al., 1995; Bohn, 1995). More discrepancies can be found in other research, in which the participants were normed as potential alcohol drinkers but not as alcohol dependent (Cooper, et al., 1997) or in which they have already finished treatment, being in a sober state (Cooney, et al., 1997; Mathew, et al., 1979). The sample difference could be a reason for the results not conforming with a great part of the studies, as could be the phase of treatment in which the participants of the present study were at the time of the participation. Still, this does not mean that the sample used for the present study is not representative and valid, on the contrary, the conditions under which the self-selected sample stands during admission make it even more valid and representative for the sake of the study.

The present study also contained some limitations, which will be examined in the following paragraph. By the time, when the participants were asked to fill out the *Drinkwijzer* questionnaire to report their craving thoughts in order to gain insight into situations, thoughts and emotions, in which they craved for alcohol, they were still in the monitoring phase. Thus, it is possible that craving thoughts can have a different effect or even be defined differently after cessation. Hence, Mathew, et al. (1979) found an inverse correlation between craving thoughts and the duration of abstinence, which is not a variable of concern during the monitoring phase. This would make craving in abstinent alcoholics a different construct than with alcoholics in treatment, which was the case in the present study. A recommendation for future research would be to test the construct validity of the *Drinkwijzer* with a pilot study in order to define the construct of craving to be more generalizable.

Moreover, the psychometric quality of the *Drinkwijzer* questionnaire might be debatable, as the construction of the scale was not evidence based but rather experience based. Although it was created by clinical experts, future research should still question the validity of the questionnaire. On the one side, the focus should rely on searching for previously validated questionnaires, re-thinking the questionnaire and empirically validating as well as establishing a sufficient reliability of the new scale. On the other side, the question should be asked if the construction of the scale as it is would have been likely to affect the results.

Furthermore, it is important to mention one more limitation regarding the *Drinkwijzer* scale. The participants were asked to answer the questionnaire with a subjectively and retrospectively rating of their craving thoughts, they might have experienced with specific situations, thoughts or emotions. Therefore, the answers were based on memory that had to be recollected, which would enhance the probability of recall bias. Coughlin (1989) states that a recall bias can also be seen as an imperfect recall. Additionally, the quality of recall is influenced by factors such as the degree of detail required and the time interval since experiencing the particular situation, thought or emotion (Coughlin, 1989). Less important are factors such as personal characteristics and significance of the events. Hence, it is assumed that the variability of the factors influencing the quality of recall in the sample is relatively high, which would compromise the reliability of the *Drinkwijzer* scale. Thus, in order to increase the reliability, the influence of important factors such as the time interval since experiencing and the degree of detail should be diminished. This could be done by introducing a journal for example in form of a mobile app in which the participants could report their craving thoughts in specific situations, they are able to describe in more detail. It would thus be more efficient and less biased to recall information of that sort.

Conclusion

The present study showed some expected and some unexpected results. It was thus expected that baseline *dependency* would predict *total-* and *negative affect craving* in alcoholics following treatment. What was rather unexpected was that *dependency* did not have an influence on the alcohol consumption as well as positive affect craving. The results of the moderator analysis were not found to be all significant. Only the moderator effect that could be found between the relation of *craving thoughts with a positive affect* and the *alcohol consumption* and *dependence* as a moderating variable can give some information on how to assess the different levels of dependency in future therapeutic approaches. But still, the count of studies that include the level of dependency as defined by the DSM-V remain meagre as the construct was mostly tried to be explained by different instruments that are not related to the DSM-V (Anton, et al., 1995). This would make further research on the role of *dependency*, especially in relation to negative and positive affect reactivity essential for being able to develop adjusted online-therapies that take the level of dependency into account. Also, further research should, next to the strengths as the uniqueness of the sample, focus on the named limitations of the present study in order to diminish the influence of possible confounding variables or artifacts. Hereby, it would be essential to re-evaluate the *Drinkwijzer* scale and from the current

state develop a evidence-based questionnaire that would probably have a higher psychometric quality. In conclusion, it is possible that this study could form the basis for research regarding the role of *alcohol dependence*. Furthermore, future research should try to emphasize factors related to craving thoughts differing in their affect in order to minimize the impact of craving thoughts within low- and high-dependent drinkers to finally reduce the consumption of alcohol.

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Appendix

Appendix I

Drink Wijzer

Hoeveel trek heb je? weinig/geen, nogal, heel erg

Hoe vaak drink je? (bijna) nooit, regelmatig, (bijna) altijd.

List with items:

1. Als ik op een feestje ben
2. Als ik een goede bui heb
3. Als ik denk dat eentje geen kwaad kan
4. Als ik pijn heb
5. Als ik druk ben
6. Als ik gespannen ben
7. Als ik aan het koken ben
8. Als ik gesport heb
9. Als ik alcohol aangeboden krijg
10. Als ik kwaad ben

11. Als ik kritiek krijg
12. Als ik onrustig ben
13. Met feestdagen
14. Als iets waarmee ik bezig ben, niet lukt
15. Als ik pieker over het verleden
16. Als ik anderen alcohol zie drinken
17. Als ik me onzeker voel
18. Als ik somber ben
19. Als ik het warm heb en transpireer, terwijl het niet warm is
20. Als ik teleurgesteld ben
21. Als ik alleen ben
22. Als ik op een terras of in een café/ restaurant ben
23. Als ik zenuwachtig ben
24. Als ik ruzie met mijn partner heb
25. Als ik tevreden over mezelf ben
26. Als het gezellig is
27. Als ik denk dat ik best sociaal kan drinken
28. Als ik met een groepje vrienden ben
29. Als ik moe ben
30. Als ik contact heb met iemand die ik aantrekkelijk vind
31. Als de sfeer gespannen is
32. Als ik ontevreden over mezelf ben
33. Als ik me ongelukkig voel
34. Als ik problemen op het werk heb
35. Als ik geen toekomst voor mezelf zie
36. Als ik me eenzaam voel
37. Als ik niks te doen heb
38. Als ik me schuldig voel
39. Als er geen alcohol in huis is
40. Als ik problemen in mijn gezin heb
41. Als iets dat ik van plan was, niet doorgaat
42. Als het tegen etenstijd loopt
43. Als ik trillende handen heb
44. Als ik vrij heb, bijvoorbeeld weekends of vakantie

- 45. Als ik succesvol ben
 - 46. Als ik oneerlijk word behandeld
 - 47. Als ik in paniek ben
 - 48. Als ik boodschappen doe in de supermarkt

Variabelenamen items Drinkwijzer – Hoeveel trek heb je? DWtrek1 t/m DWtrek50

nogal = 2

heel erg = 3

Appendix 2

Inter-rater reliability (Cohen's Kappa) and scale reliability analyses (Cronbach's Alpha)

Symmetric Measures

		Asymptotic Standardized Value	Error ^a	Approximate T ^b	Approximate Significance
Measure of Agreement	Kappa	,766	,126	3,920	,000
N of Valid Cases		26			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Reliability Statistics

Cronbach's Alpha	N of Items
,944	26

Appendix 3a

Exploratory factor analysis for all 50 craving items of the *Drinkwijzer*

Rotated Component Matrix^a

	Component									
	1	2	3	4	5	6	7	8	9	10
t11	,799									
t32	,795									
t20	,790									
t47	,790									
t10	,790									
t46	,762									
t33	,759									
t38	,744									
t50	,742									
t31	,730									
t24	,708									
t23	,706									
t18	,695									
t17	,680									
t40	,660									
t6	,627									
t12	,603									
t14	,599									
t36	,586			,546						
t34	,575									
t15	,571									
t35	,570									
t13		,788								
t28		,772								
t1		,771								
t22		,771								
t26		,764								
t44		,762								
t9		,579								
t25			,691							
t45			,676							
t2			,676							
t49			,608							
t5			,467				,416			
t29			,452							
t37				,741						
t21				,658						
t48										
t42				,808						
t7				,755						
t19					,628					
t41	,415				,428					
t30						,689				
t43						,443	,486			
t16			,437				,468			
t4							,700			
t8								,636		
t27			,591						,593	
t39										-,478
t3										,449

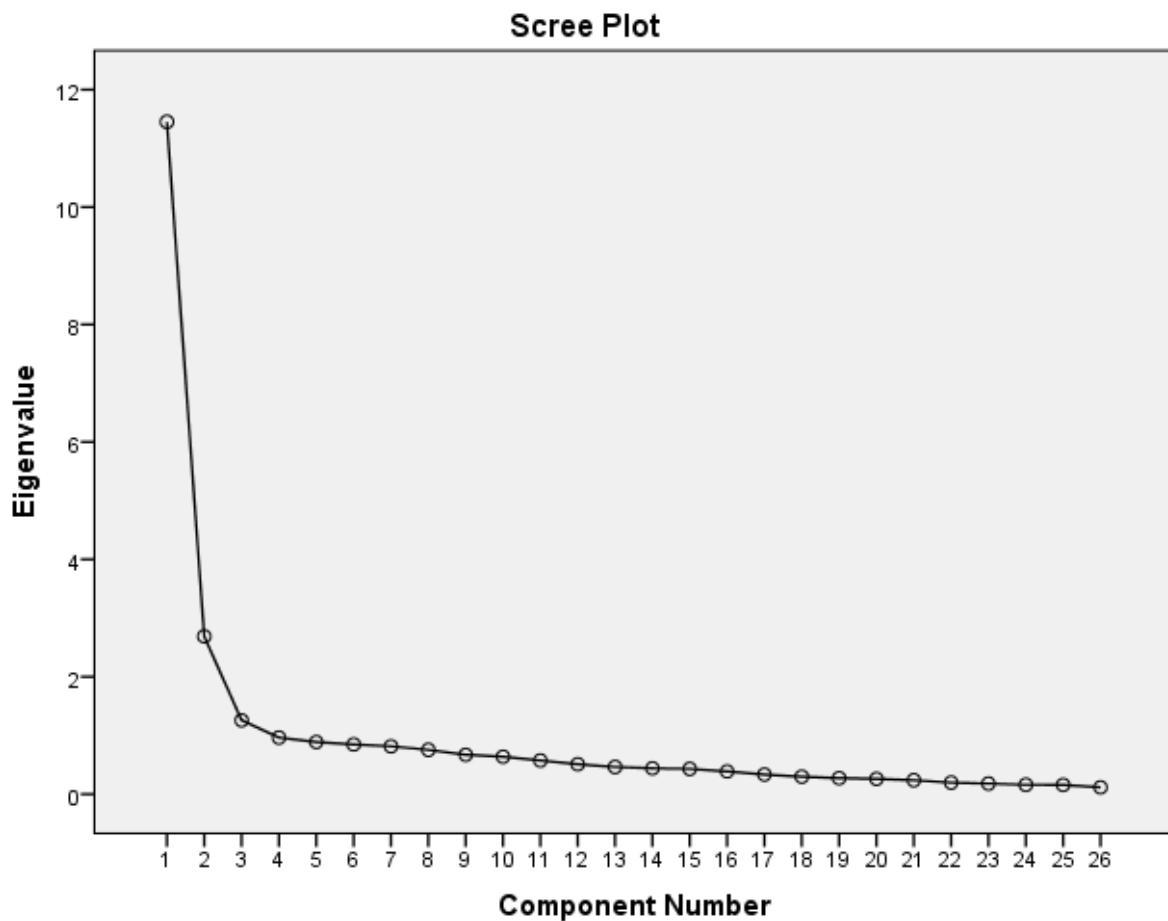
Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 17 iterations.

Appendix 3b

Confirmatory factor analysis containing 26 of the *Drinkwijzer* questionnaire



*Rotated
Component
Matrix^a*

	Component
	1 2
t47	,829
t10	,818
t33	,799
t32	,793
t20	,777
t18	,758
t11	,748
t38	,731
t46	,730
t50	,728
t31	,727
t23	,704
t40	,696
t24	,682
t17	,678
t35	,663
t6	,656
t15	,654
t14	,630
t12	,629
t34	,521
t45	,840
t25	,798
t49	,793
t2	,701
t29	,470

Extraction
Method: Principal
Component
Analysis.

Rotation Method:
Varimax with
Kaiser
Normalization.

- a. Rotation
converge
d in 3
iterations

Appendix 4

Regression analysis with mean scores on total affect craving as IV and mean number of glasses in 30 days as DV

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8159,006	1	8159,006	1,032	,312 ^b
	Residual	837717,846	106	7902,999		
	Total	845876,852	107			

a. Dependent Variable: Alcohol consumption in 30 days

b. Predictors: (Constant), Total affect craving

Appendix 5

Regression analysis with negative affect craving as IV and mean number of glasses in 30 days as DV

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6730,927	1	6730,927	,850	,359 ^b
	Residual	839145,924	106	7916,471		
	Total	845876,852	107			

a. Dependent Variable: Alcohol consumption in 30 days

b. Predictors: (Constant), Negative affect craving

Appendix 6

Regression analysis with positive affect craving as IV and mean number of glasses in 30 days as DV

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5681,665	1	5681,665	,717	,399 ^b
	Residual	840195,187	106	7926,370		
	Total	845876,852	107			

a. Dependent Variable: Alcohol consumption in 30 days

b. Predictors: (Constant), Positive affect craving

Appendix 7

Paired samples t-test with mean scores on negative affect craving and positive affect craving

Paired Samples Test

	Paired Differences						Sig. (2-tailed)	
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper	t		
Negative affect craving - Positive affect craving	-,097	,585	,056	-,209	,014	-1,731	107 ,086	

Appendix 10

Descriptive statistics of sex, age, alcohol use in 30 days, craving scores and dependency

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Valid N (listwise)	108				
Age	108	21	75	47,82	10,458
Total affect craving	108	1	3	1,75	,462
Negative affect craving	108	1	3	1,77	,524
Positive affect craving	108	1	3	1,68	,480
Alcohol consumption in 30 days	150	0	688	52,21	86,731

Dependency

			Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low dependency		44	29,3	40,7	40,7
			64	42,7	59,3	100,0
	Total		108	72,0	100,0	
Missing	System		42	28,0		
	Total		150	100,0		

Sex

		Frequency	Percent	Valid	Cumulative
				Percent	Percent
Valid	Male	51	34,0	47,2	47,2
	Female	57	38,0	52,8	100,0
	Total	108	72,0	100,0	
Missing	System	42	28,0		
	Total	150	100,0		

Appendix 11

Test of between-subjects effects with dependency as fixed factor and positive affect-, negative affect- and total affect craving as well as the alcohol consumption in 30 days DV

Dependency	Total affect craving	1,824	1	1,824	9,220	,003
	Positive affect craving	,210	1	,210	,910	,342
	Negative affect craving	2,443	1	2,443	9,611	,002
	Alcohol consumption in 30 days	15433,943	1	15433,943	1,970	,163

Appendix 12

Behandelflow Alcoholdebaas

- 1 Intake vragenlijst
- 2 Opdracht: voordelen en nadelen
- 3 Opdracht: agenda bijhouden
- 4 Opdracht: situaties analyseren
- 5 Drinkwijzer
- 6 Lijst tussenmeting
- 7 Opdracht: doel stellen
- 8 Lijst motivatie
- 9 Opdracht: helpende gedachte
- 10 Opdracht: helpend gedrag
- 11 Opdracht: beslissingen
- 12 Opdracht: actieplan
- 13 Lijst nameting

14 Lijst 6 weken

15 Lijst half jaar

Appendix 13

Participant Information ‘Drink Wijzer’

Voor ons volgende contact wil ik graag nog wat meer zicht proberen te krijgen op verschillende situaties waarin je mogelijk zin krijgt in alcohol. Hieronder vind je daarvoor een opdracht, de Drink Wijzer, waarin je verschillende situaties kunt aanvinken waarbij je zin in drinken hebt. Met deze informatie en alle informatie die je hebt gegeven in de vorige contacten, kan ik een samenvatting maken van de belangrijkste punten rondom je drankgebruik. In het volgende contact gaan we daar dieper op in.

Appendix 14

Moderator analysis with craving with positive affect as IV, dependency as moderator variable and the use of alcohol in 30 days as DV

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1	(Constant)	54,178	8,434	6,424	,000
	Positive affect craving	18,400	17,639	,099	1,043 ,299
	Dependency	94,311	62,139	,524	1,518 ,132
	Dependency*p positive affect craving	-72,486	36,008	-,695	-2,013 ,047

a. Dependent Variable: Alcohol consumption in 30 days

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,252 ^a	,064	,037	87,265	,064	2,359	3	104	,076

a. Predictors: (Constant), Dependency, positive affect craving, dependency*positive affect craving

Appendix 15

Moderator analysis with craving with negative affect as IV, dependency as moderator variable and the use of alcohol in 30 days as DV

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	56,477	8,824		6,400	,000
Negative affect craving	26,275	16,970	,155	1,548	,125
Dependency	57,057	62,469	,317	,913	,363
Dependency*n egative affect craving	-52,069	35,152	-,516	-1,481	,142

a. Dependent Variable: gebruik_maand

Appendix 16

Moderator analysis with total affect craving as IV, dependency as moderator variable and the alcohol consumption in 30 days as DV

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
1 (Constant)	57,134	8,755		6,526	,000
Total affect craving	31,666	19,102	,164	1,658	,100
Dependency	87,653	69,245	,487	1,266	,208
Dependency*to tal affect craving	-70,535	39,489	-,689	-1,786	,077

a. Dependent Variable: Alcohol consumption in 30 days